

REMARKS

Claims 1-8, 10-12, 21-32, 44-51, and 59-66 remain pending and under consideration. Claims 1, 21, and 44 are independent claims. Claims 9, 13, 15, 17-20, 33-43, and 52-58 drawn to non-elected species are currently withdrawn from consideration. Claims 13, 17, 33, 39, and 52 are independent Claims. Claims 1-8, 10-13, 15, 17-19, 21-23, 33-35, 39-41, 44-46, and 52-57 have been amended, and Claims 59-66 have been added. Claims 14 and 16 have been cancelled. Reexamination and reconsideration of the application, as amended, are hereby respectfully requested.

Interview

Applicant wishes to thank the Examiner for courtesies extended during the personal interview conducted on 09/14/2004, and acknowledges receipt of an Interview Summary mailed 09/24/2004. The interview was attended personally by Examiner Alessandro Amari and Applicant Thomas W. Mossberg, and attended telephonically by Applicant's Agent David S. Alavi. In the course of the interview, it was agreed that Claim 1 (and analogously, Claims 21 and 44), as amended hereinbelow, patentably distinguishes over references of Maeda and Brady. This agreement was based on a discussion focused on the preferential routing of optical signals by *individual* diffractive elements of the claimed apparatus, in contrast to the *collective* routing of optical signals by sets of diffractive elements in the devices of Maeda and Brady. This distinction is discussed further hereinbelow.

Specification

Examiner has objected to the title of the invention as not descriptive. The title has been amended according to the Examiner's suggestion.

The specification has also been amended as needed to refer to newly-added Figures in the appropriate places, as described further hereinbelow.

Drawings

Examiner has objected to the drawings as not showing every feature of the invention specified in the Claims, specifically Claims 27-32 and Claims 50-51.

Accordingly, Figs. 14A, 14B, and 15-18 have been added to show such features. No new matter has been added, since the new Figures only show features described in the specification and that appear in the claims as originally filed. Figs. 14 and 15 specifically show features recited in Claims 27-32 and 50-51 of elected Species 2. Fig. 16 shows features recited in claims of non-elected Species 3, Fig. 17 shows features recited in claims of non-elected Species 4, and Fig. 18 shows features recited in claims of non-elected Species 5 and 6. Figs. 16-18 have been added in anticipation of reinstatement and consideration of claims drawn to non-elected Species upon allowance of generic Claim 1. This is discussed further hereinbelow.

The phrases “internal photoexposure” and “external photoexposure” are introduced in paragraph [0048] as convenient labels (for use in the Figures) for procedures already described in the text as originally filed. No new matter has been added.

A full set of replacement drawing sheets is attached hereto. Sheets 1-13, containing original Figs. 1-13, are unchanged except for the total number of sheets shown at the top of each sheet, which has been changed from “13” to “18”. Proposed new Figs. 14A-14B and 15-18 are presented on new drawings sheets 14-18.

Claim Rejections

Examiner has rejected Claims 1-8, 10-12, 21-27, 31, 32, 44-46, and 48-51 under 35 USC §102(b) as anticipated by Maeda (US4824193). Applicant respectfully traverses the rejections, since it is believed that Claims 1-8, 10-12, 21-27, 31, 32, 44-46, 48-51, and 59-62, as amended herein, patentably distinguish over Maeda.

With respect to Claims 1, 21, and 44, each of these independent claims recites, as amended herein, that the volume hologram comprises a set of diffractive elements, each of which *individually* provides preferential routing of at least a portion of an optical signal between the input optical port and the output optical port. This is disclosed in Fig. 10, for example, where each of diffractive elements 1002 is individually contoured and positioned so as to individually image portions of an optical signal between optical ports 1004 and 1006. In the device disclosed by Maeda, preferential routing of optical signals is only achieved through the collective effect of the entire hologram, and not by

individual elements thereof. Since all elements and limitations recited in Claim 1, 21, or 44 are not disclosed by Maeda, Applicant respectfully submits that the rejections under 35 USC §102 are improper, and respectfully requests their withdrawal. Applicant respectfully submits that there is no teaching, motivation, or suggestion in Maeda of such routing of optical signals by individual diffractive elements. Therefore, rejection under 35 USC §103 would also be improper.

With respect to Claims 4, 10, 22, and 45, each of these dependent claims recites that the diffractive elements of the volume hologram are collectively arranged so as to comprise temporal transformation information (in combination with spatial transformation information in Claims 22 and 45). Examiner has stated that Maeda teaches that the volume hologram comprises temporal, spectral, and spatial transformation, and goes on to cite Figs. 3A, 8, 12, and 16, as well as column 5 lines 29-52, column 8 line 57 through column 9 line 12, column 10 line 48 through column 11 line 9. However, none of the cited figures or text sections discloses anything regarding temporal transformation information. A computer search of the text of Maeda yields no occurrences of the word "temporal". The device of Maeda, which functions as a thin diffraction grating, is unsuitable for effecting temporal transformations of optical signals, and no such use is shown, taught, or suggested anywhere in Maeda. The only use taught for the device of Maeda is as a multiplexer or a demultiplexer, which involves wavelength-dependent redirection of optical signals, but does not encompass any temporal transformation of the optical signals. Since all elements and limitations recited in Claim 4, 10, 22, or 45 are not disclosed by Maeda, Applicant respectfully submits that the rejections under 35 USC §102 are improper, and respectfully requests their withdrawal. Applicant respectfully submits that there is no teaching, motivation, or suggestion in Maeda of such temporal transformation of optical signals. Therefore, rejection under 35 USC §103 would also be improper.

Regarding Claims 7 and 8, Examiner has stated that Maeda discloses that the optical medium comprises a planar optical waveguide, with propagation of the optical signals within the planar waveguide substantially guided in at least one dimension. Applicant respectfully disagrees, since there is no structure or device disclosed in Maeda that could be construed as a planar waveguide. Maeda disclosed holograms

formed on substantially planar optical substrates, but in order to function as disclosed, optical signals must propagate with a substantial component *perpendicular* to the plane defined by the optical element. In contrast, an optical signal propagating within a planar waveguide, substantially confined in one dimension thereby, would have essentially no perpendicular component of its propagation, but would propagate only substantially *parallel* to the planar waveguide. Since all elements and limitations recited in Claim 7 or 8 are not disclosed by Maeda, Applicant respectfully submits that the rejections under 35 USC §102 are improper, and respectfully requests their withdrawal. Applicant respectfully submits that there is no teaching, motivation, or suggestion in Maeda of such parallel propagation of optical signals. Therefore, rejection under 35 USC §103 would also be improper.

Regarding Claims 25 and 48, Examiner has stated that Maeda teaches that the pattern is imparted on both faces of the substrate as described in column 2 lines 35-39. Applicant respectfully points out that the cited text does not disclose imparting a pattern *on both sides* of the substrate, but rather discloses imparting a pattern by interference of laser beams *incident from both sides* of the substrate. The cited text is silent as to the location of the imparted pattern, although one might infer that the pattern thus imparted would be within the photosensitive layer. Maeda nowhere discloses imparting a pattern on both sides of a substrate. Since all elements and limitations recited in Claim 25 or 48 are not disclosed by Maeda, Applicant respectfully submits that the rejections under 35 USC §102 are improper, and respectfully requests their withdrawal. Applicant respectfully submits that there is no teaching, motivation, or suggestion in Maeda for imparting a pattern on both sides of a substrate. Therefore, rejection under 35 USC §103 would also be improper.

Regarding Claims 59-62, Maeda nowhere discloses forming a hologram or imparting a pattern by stamping or embossing. The only methods disclosed by Maeda are spatially-selective photoexposure and electron beam direct writing. Since all elements and limitations of Claim 59, 60, 61, or 62 are not disclosed by Maeda, Applicant respectfully submits that the rejections under 35 USC §102 are improper, and respectfully requests their withdrawal. Applicant respectfully submits that there is no teaching, motivation, or suggestion in Maeda for forming a hologram or imparting a

pattern by stamping or embossing. Therefore, rejection under 35 USC §103 would also be improper.

Examiner has rejected Claims 1-3, 6-8, 12, 21, 24, 26-32, 44, and 49-51 under 35 USC §102(b) as anticipated by Brady (Appl. Optics, Vol. 30, No. 17, pp. 2324-2333, 10 June 1991). Applicant respectfully traverses the rejections, since it is believed that Claims 1-3, 6-8, 12, 21, 24, 26-32, 44, 49-51, and 59-62, as amended herein, patentably distinguish over Brady.

With respect to Claims 1, 21, and 44, each of these independent claims recites, as amended herein, that the volume hologram comprises a set of diffractive elements, each of which *individually (i.e., without any other element)* provides preferential routing of at least a portion of an optical signal between the input optical port and the output optical port. This is disclosed in Fig. 10, for example, where each of diffractive elements 1002 is individually contoured and positioned so as to individually image portions of an optical signal between optical ports 1004 and 1006. In the device disclosed by Brady, routing of optical signals is only achieved through the combined effect of diffractive elements and two focusing elements, and not by individual diffractive elements alone. Since all elements and limitations recited in Claims 1, 21, or 44 are not disclosed by Brady, Applicant respectfully submits that the rejections under 35 USC §102 are improper, and respectfully requests their withdrawal. Applicant respectfully submits that there is no teaching, motivation, or suggestion by Brady of such routing of optical signals by individual diffractive elements. Therefore, rejection under 35 USC §103 would also be improper.

Further in regard to Claim 1, 21, and 44, nowhere does Brady disclose that the diffractive elements of the hologram are arranged so as to comprise temporal, spectral, or spatial transformation information, as recited in the rejected claims. The only function disclosed for the device of Brady is simple redirection of a plane-wave optical signal. Brady does not show, teach, or suggest arranging the diffractive elements of a hologram for effecting a temporal transformation, a spectral transformation, or a spatial transformation. Since all elements and limitations recited in Claims 1, 21, or 44 are not disclosed by Brady, Applicant respectfully submits that the rejections under 35 USC §102 are improper, and respectfully requests their withdrawal. Applicant respectfully

submits that there is no teaching, motivation, or suggestion by Brady of such arrangement of the diffractive elements so as to comprise temporal, spectral, or spatial transformation information. Therefore, rejection under 35 USC §103 would also be improper.

Regarding new Claims 59-62, Brady nowhere discloses forming a hologram or imparting a pattern by stamping or embossing. The only method disclosed by Brady is spatially-selective photoexposure of photorefractive media. Since all elements and limitations of Claim 59, 60, 61, or 62 are not disclosed by Brady, Applicant respectfully submits that the rejection under 35 USC §102 would be improper. Applicant respectfully submits that there is no teaching, motivation, or suggestion in Brady for forming a hologram or imparting a pattern by stamping or embossing. Therefore, rejection under 35 USC §103 would also be improper.

Examiner has rejected Claims 28-30 and 47 as being unpatentable over Maeda in view of Veldcamp (US4846552). Applicant respectfully traverses the rejections, since it is believed that Claims 28-30 and 47, as amended herein, patentably distinguish over Maeda in view of Veldcamp.

As set forth hereinabove, Applicant respectfully submits that Maeda does not disclose all elements and limitations of parent Claims 21 or 44. Veldcamp does not disclose all elements and limitations of parent Claims 21 or 44 that are missing from Maeda. Since all elements and limitations of Claim 28, 29, 30, or 47 are not disclosed by the combination of Maeda and Veldcamp, Applicant respectfully submits that the rejections under 35 USC §103 is improper, and respectfully requests their withdrawal.

Applicant respectfully submits that new Claims 59-62 patentably distinguish over Maeda in view of Veldcamp. Claims 59-62 read on elected Species 2. As set forth hereinabove, Applicant respectfully submits that Maeda does not disclose all elements and limitations of parent Claims 21 or 44, and Veldcamp does not disclose all elements and limitations of parent Claims 21 or 44 that are missing from Maeda. Veldcamp nowhere discloses forming a hologram or imparting a pattern by stamping or embossing. The only methods disclosed by Veldcamp are lithographic methods. Since all elements and limitations of Claim 59, 60, 61, or 62 are not disclosed by the

combination of Maeda and Veldcamp, Applicant respectfully submits that rejection under 35 USC §103 would be improper.

Additional Claim Amendments

In a case recently decided by the United States Court of Appeals for the Federal Circuit (CAFC), certain language in one of the patents at issue, similar to language originally employed in some of the claims of the instant application, has been construed in a manner differing from that intended by the Applicants. It is not clear whether the CAFC claim construction is specific to the fact patterns of the decided case, or may be applied more generally. Accordingly, the claims in question have been amended so as to ensure that the claims will be construed in the manner originally intended by the Applicants.

The recently-decided case is *Superguide Corporation v. Directv, Inc.* (CAFC 02-1561, -1562, and -1594, decided 02/12/2004). At least within the context of *Superguide*, the Court has interpreted “at least one of” followed by a conjunctive list of items in the patent in suit (US 5038211) to mean at least one of *each* item in the list. In the instant application, the Applicant intended “at least one of” followed by such a list to mean at least one item *from* the list. Since the claim construction of the CAFC in *Superguide* may at least raise the possibility of a narrower claim construction than that intended by the Applicant, claims containing “at least one of” followed by a pair or list of items have been amended. In each instance, the phrase “at least one of” has been deleted, and the conjunction “and” in the subsequent pair or list of items has been replaced by the conjunction “or”. In the claims, the conjunction “or” is to be construed inclusively (e.g., “a dog or a cat” would be interpreted as “a dog, or a cat, or both”; Bryan A. Garner, Elements of Legal Style p. 103, 2nd ed. 2002), unless: i) it is explicitly stated otherwise, e.g., by use of “either...or”, “only one of...”, or similar language; or ii) two or more of the listed alternatives are mutually exclusive within the context of the claim, in which case “or” would encompass only those combinations involving non-mutually-exclusive alternatives.

Non-elected Species

Since it is believed that generic Claim 1 is in condition for allowance, Applicant respectfully requests reinstatement and consideration of claims reading on non-elected Species 1 and 3-6 (Claims 9, 13, 15, 17-20, 33-43, 52-58, and 63-66). These claims are written in dependent form or otherwise include all of the limitations of generic Claim 1, as set forth hereinbelow.

With respect to Species 1 (Claims 13, 15, and 63), Claim 13 has been amended so as to include all of the limitations of Claim 1 (including the limitation that each diffractive element *individually* provides preferential routing of an optical signal between optical ports), and includes the added limitation that the pattern imparted to form the volume hologram is a calculated interference pattern. Claims 15 and 63 are dependent on Claim 13.

With respect to Species 3 (Claims 33-38 and 65), Claim 33 has been amended so as to include all of the limitations of Claim 1 (including the limitation that each diffractive element *individually* provides preferential routing of an optical signal between optical ports), and includes the added limitation that the pattern is imparted onto a material layer that is then deposited onto a planar waveguide substrate to form the volume hologram. Claims 34-38 and 65 are dependent on Claim 33.

With respect to Species 4 (Claims 39-43 and 66), Claim 39 has been amended so as to include all of the limitations of Claim 1 (including the limitation that each diffractive element *individually* provides preferential routing of an optical signal between optical ports), and includes the added limitation that the pattern is imparted onto a support slab, which is then pressed against a planar waveguide substrate to form the volume hologram. Claims 40-43 and 66 are dependent on Claim 39.

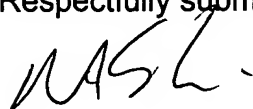
With respect to Species 5 (Claims 52-58), Claim 52 has been amended so as to include all of the limitations of Claim 1 (including the limitation that each diffractive element *individually* provides preferential routing of an optical signal between optical ports), and includes the added limitation that the pattern is imparted by spatially-selective photoexposure to form the volume hologram. Claims 53-58 are dependent on Claim 52.

With respect to Species 6 (Claims 9, 17-20, and 64), Claim 17 has been amended so as to include all of the limitations of Claim 1 (including the limitation that each diffractive element *individually* provides preferential routing of an optical signal between optical ports), and includes the added limitation that the pattern is imparted into the volume of a planar waveguide to form the volume hologram. Claims 40-43 and 66 are dependent on Claim 39. Claim 9 is dependent on generic Claims 1 and 7.

Conclusion

In view of the above, it is submitted that Claims 1-8, 10-12, 21-32, 44-51, and 59-62 are in condition for allowance. Allowance of Claims 1-8, 10-12, 21-32, 44-51, and 59-62 at an early date, and reinstatement and allowance of non-elected species Claims 9, 13, 15, 17-20, 33-43, 52-58, and 63-66, are earnestly solicited.

Respectfully submitted,



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